

Estimating Consumer Default Sensitivities to Financial Stress Factors Through Counterfactual Analysis

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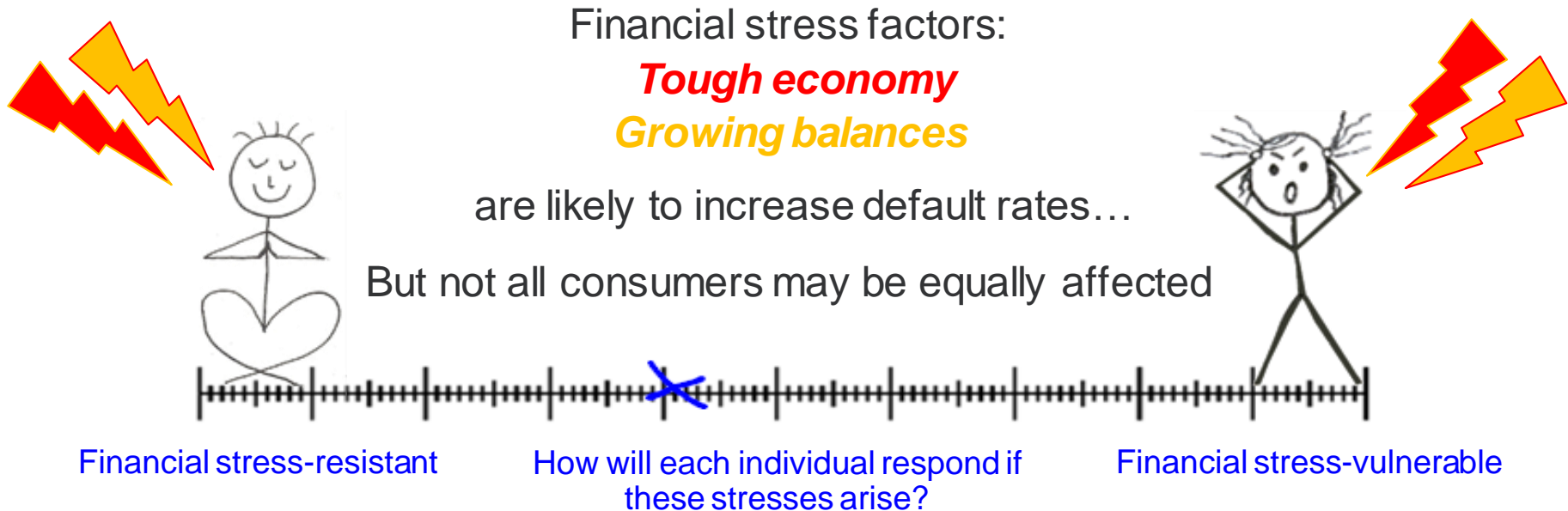


Agenda

Objective and Concept

Methodology and Insights

Objective



- Understand individuals' sensitivities to financial stresses arising from
 - Recessionary economies
 - Increasing credit card balances



Concept

- Developed new indices, based on credit bureau data, to rank order consumers according to default sensitivities
 - Economic Sensitivity Index
 - Balance Change Sensitivity Index

Consumer ID	FICO® Score	Economic Sensitivity	Balance Change Sensitivity
#1	671	Low	Medium
#2	689	High	High
#3	730	Medium	High
...

Mitigate Cycle Sensitivity

In Times of Economic Uncertainty, Prefer Consumers Who Are Less Sensitive to the Economy

Consumer ID	FICO® Score	Economic Sensitivity
#1	674	Low 
#2	682	High 
#3	739	Medium
...



← Target/increase exposure

← Don't target/decrease exposure

- Consumer #1 is preferred over consumer #2—despite marginally lower risk score
- Swap sets:
 - Lend more to stress-resistant consumers and less to more sensitive ones at similar risk scores

Account for Affordability In Credit Card Limit Decisions

When Managing Card Limits, Prefer Consumers With Low Balance Sensitivity

Consumer ID	FICO® Score	Balance Change Sensitivity
#4	683	High
#5	732	Low 
#6	746	High 
...

← More aggressive limits

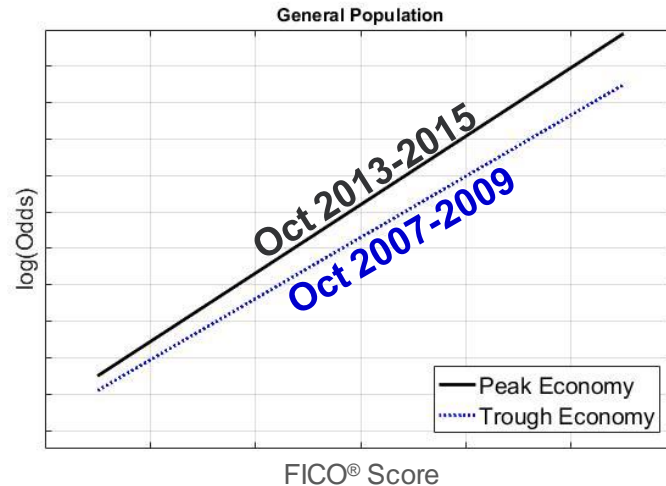
← More conservative limits

- Allowing consumer #5 to grow her credit card balance is preferred over allowing consumer #6 to grow his balance—despite marginally lower risk score

Admiring Stress Situations Part I: The Great Recession

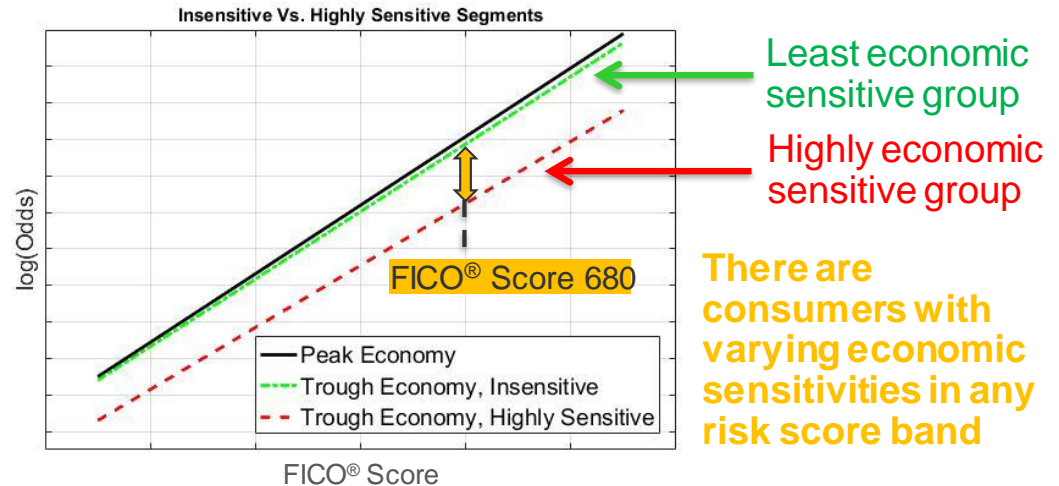
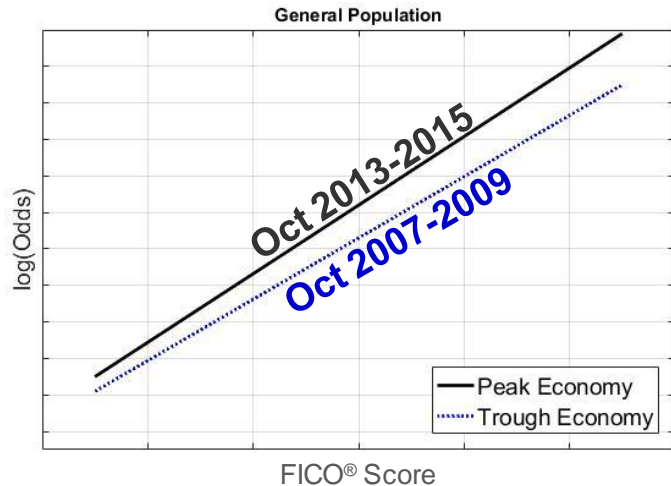
Economic Cycle Sensitivity Example (US)

- FICO® Score is designed to rank order credit risk
- Odds to Score relation:
 - In a “normal” economic period expect the relation to be stable
 - In a period of economic stress expect the line to shift and/or rotate downwards



But Not All Consumers Are Equally Sensitive to a Recession

- Consumers with low economic sensitivity maintained stable Odds during the last US recession – they are decoupled from the economy
- Odds drop substantially for the most sensitive consumers



There are consumers with varying economic sensitivities in any risk score band

90+ DPD Rates (Worst Performance on Any Trade Line) for FICO® Score 680 Consumers

Solid Versus Trough Economy

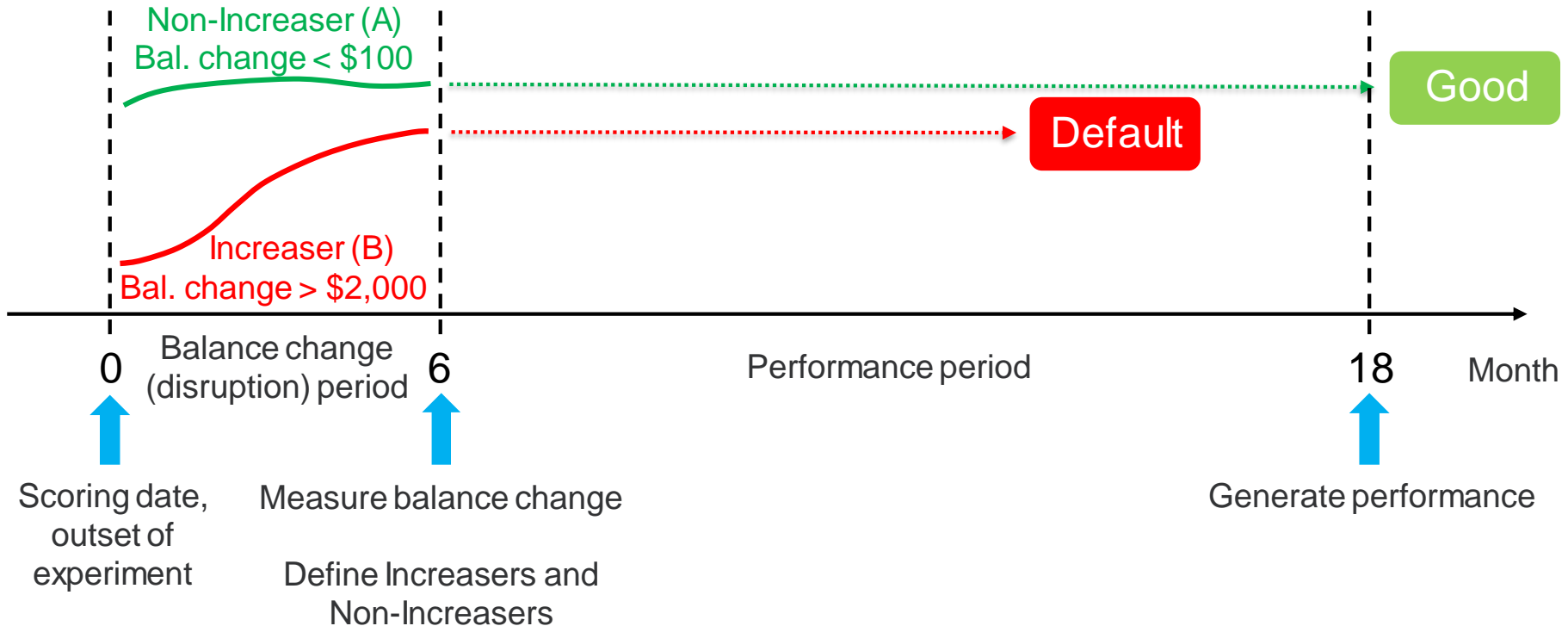
90+ DPD Rate	All @ FICO® Score ~680	20% Most Sensitive @ FICO® Score ~680	20% Least Sensitive @ FICO® Score ~680
Solid Economy	12.5%	14.0%	11.8%
Trough Economy	20.7% ↑	29.3% ↑	13.7% ↑

- Bad rate more than doubles during stressed economic period for the 20% most sensitives in this score band
- Bad rate hardly varies across economic conditions for the 20% least sensitives in this score band

Admiring Stress Situations Part II: Credit Card Balance Overextension

Longitudinal Study Design to Analyze Effects of Rapid Balance Increases on Default Likelihood

Natural A/B experiments play out all the time



90+ DPD Rates (Worst Performance on Any Trade Line) for Consumers @ 610-710

Non-Increasers Versus Increasers

90+ DPD Rate*	All @ FICO® Score 610-710	20% Most Sensitive @ FICO® Score 610-710	20% Least Sensitive @ FICO® Score 610-710
Non-Increasers	14.3%	14.2%	16.4%
Increasers	20.2% ↑	22.8% ↑	17.1% ▲

*During performance period subsequent to balance change period

- Bad rate varies considerably across balance stress conditions for the 20% most sensitives in this score band
- Bad rate hardly varies across balance stress conditions for the 20% least sensitives in this score band

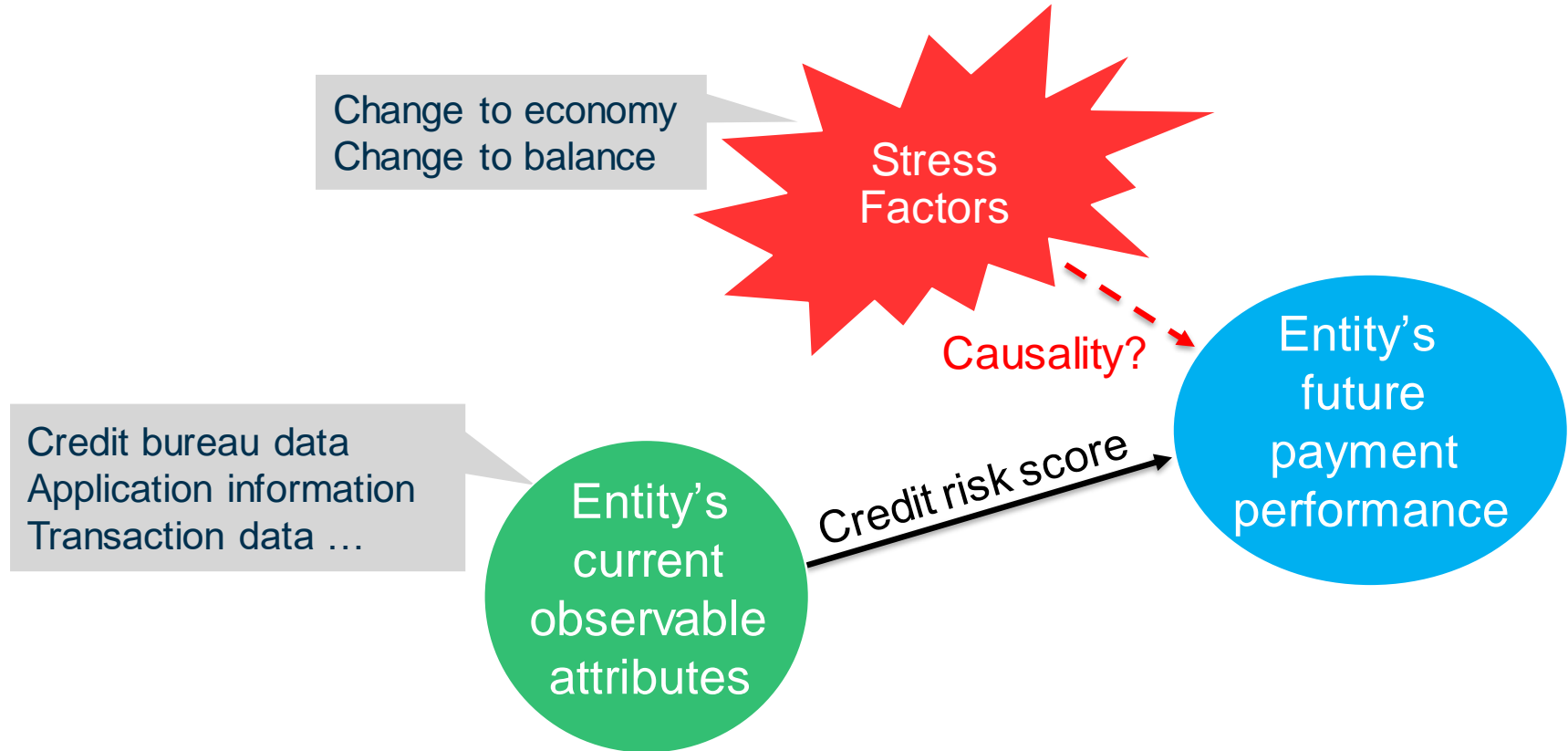


Agenda

Objective and Concept

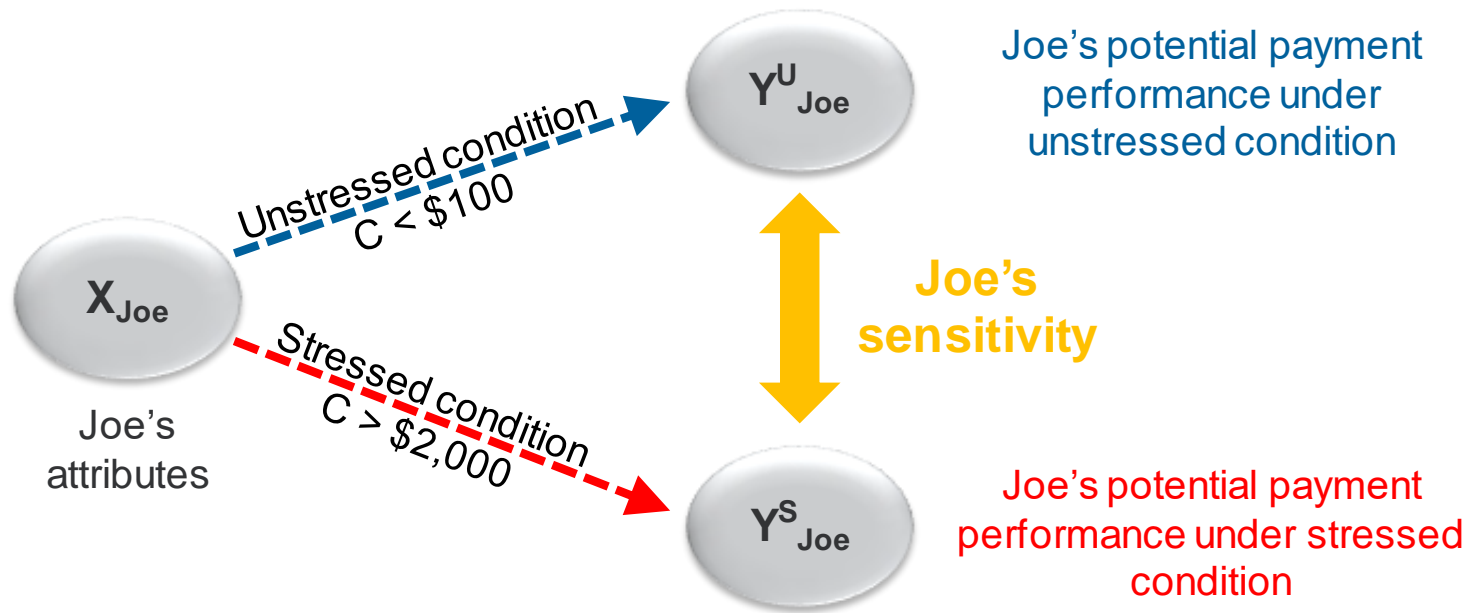
Methodology and Insights

Understanding Effects of Stress Factors on Future Performance



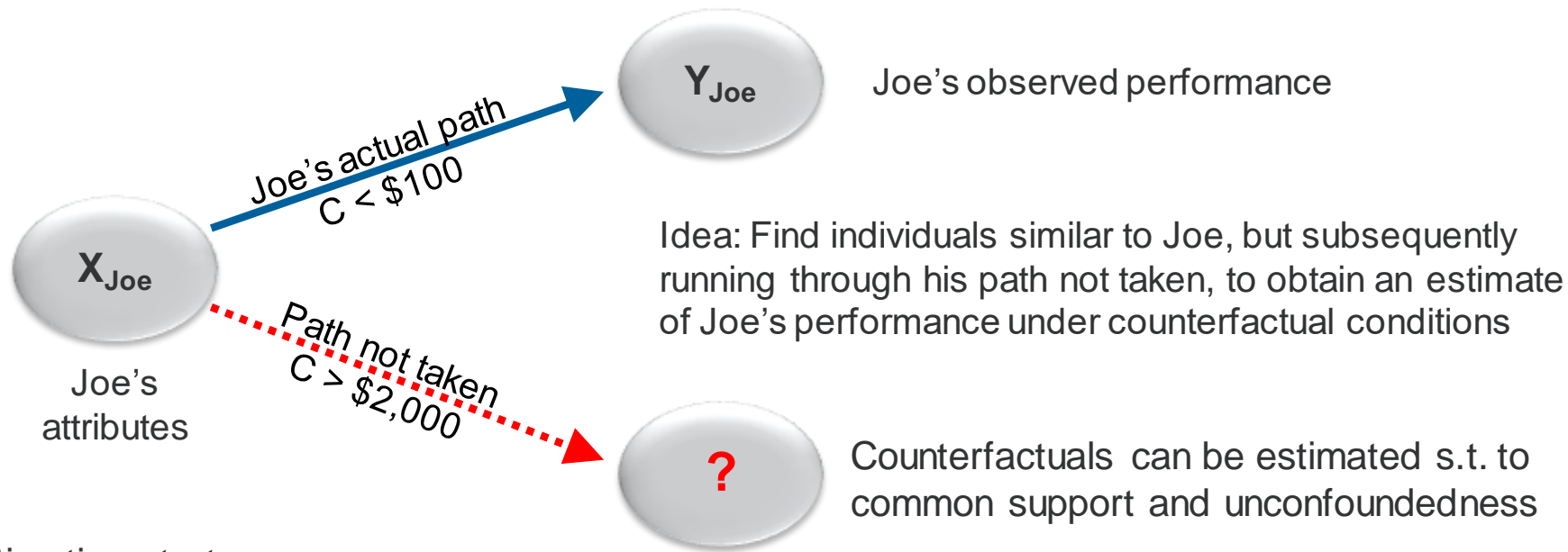
Potential Outcomes Framework for Defining Individual Sensitivity to Stress

Rubin Causal Model



- Sensitivity is defined on the individual, as a comparison
 - Difference in potential payment performance under unstressed versus stressed conditions

Counterfactual Analysis

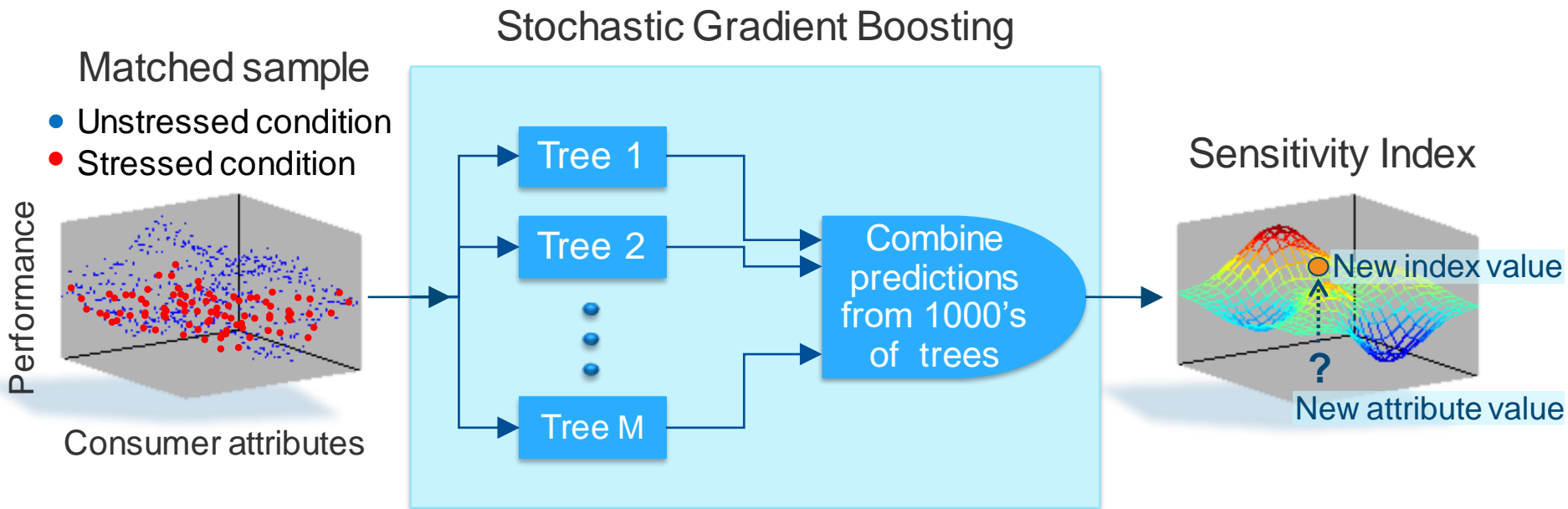


Estimation strategy:

1. Generate matched data set, by pairwise matched sampling of stressed and unstressed individuals based on non-parametric propensity score
2. On matched, develop non-parametric regression model to predict performance, allowing for interactions between stress indicator and attributes (so effect of stress can depend on individual)

Machine Learning Approach

Learns Optimal Mapping from Consumer Attributes to Stress Sensitivity Index



Empirical Findings

- In each FICO® Score band we find substantial variation in estimated sensitivities
- Joint frequencies:

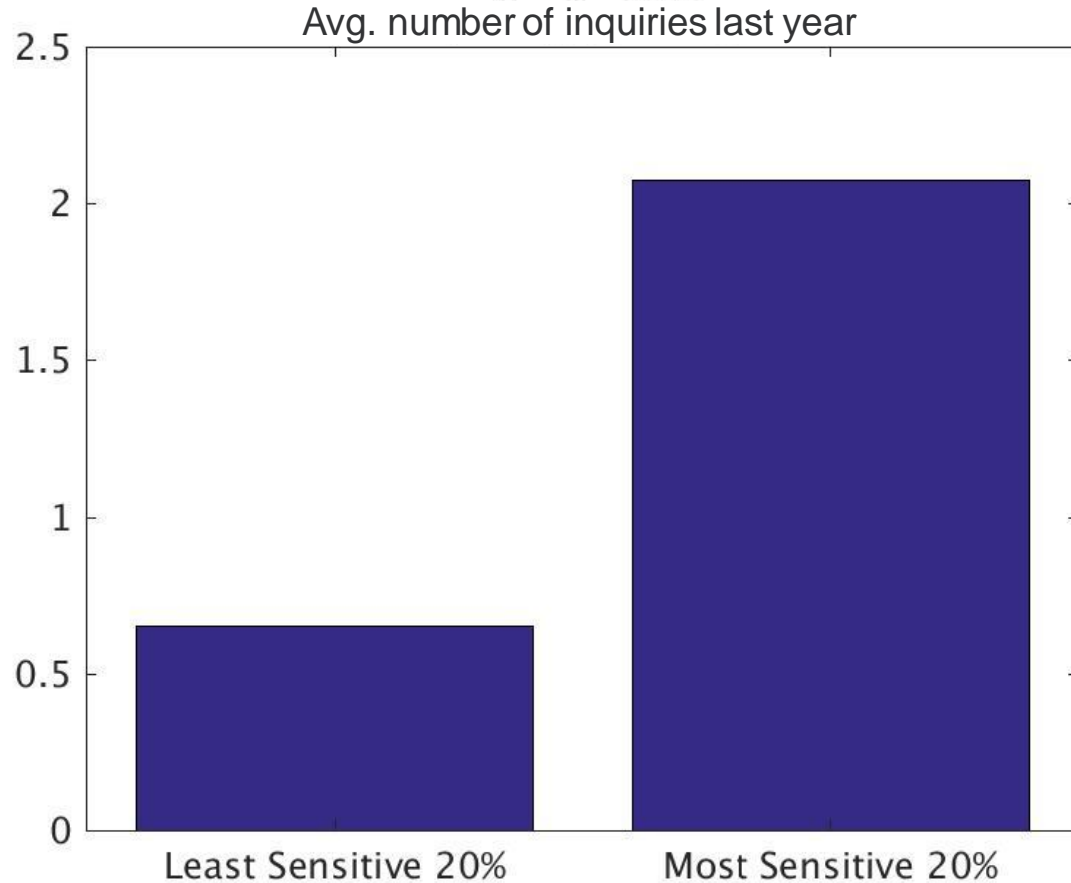
		<u>FICO_300to650</u>	<u>FICO_650to700</u>	<u>FICO_700to750</u>	<u>FICO_750toInf</u>
Quartiles of Balance Change Sensitivity Index	Least sensitive	2.34	1.23	2.47	18.95
		4.29	2.21	3.39	15.12
		8.13	3.50	4.39	8.98
	Most sensitive	10.56	5.67	5.65	3.11

$$\Sigma = 100\%$$

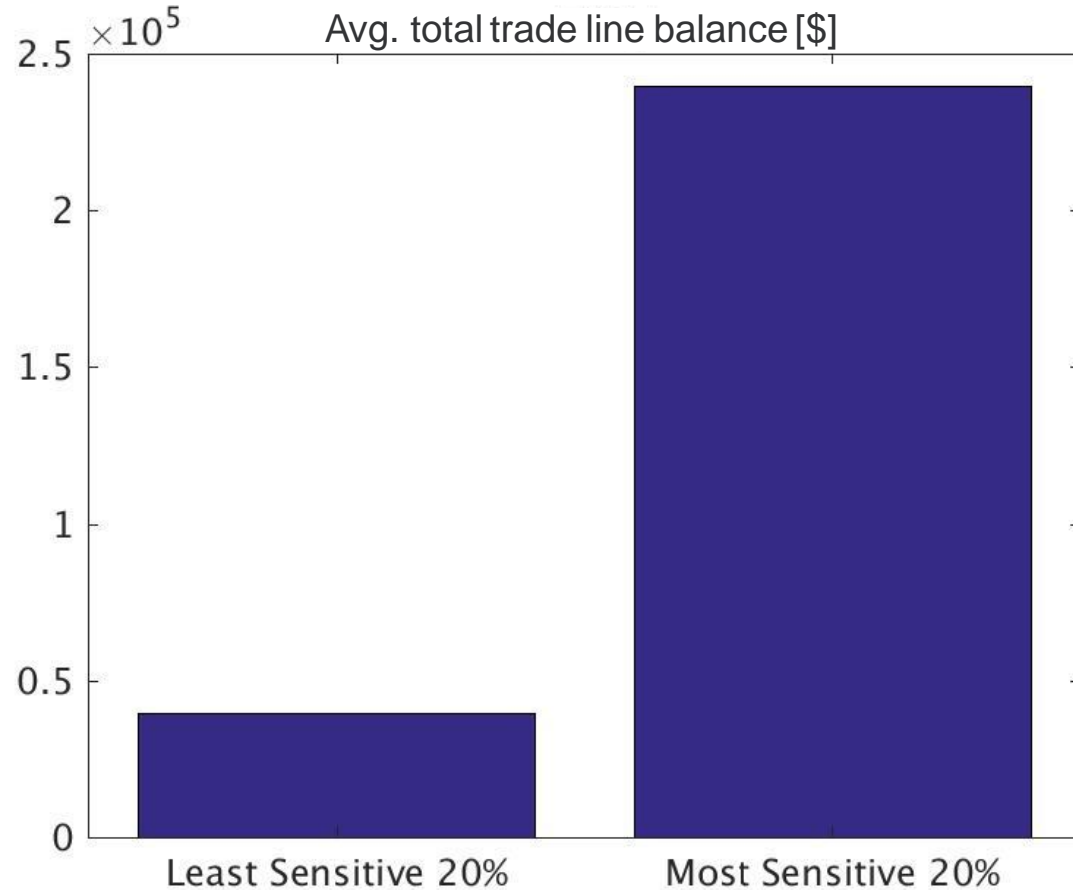
(qualitatively similar results for Economic Sensitivity Index)

- Two consumers can have the same FICO® Score yet very different sensitivities
- Higher FICO® Scores tend to be less sensitive, but association isn't too strong

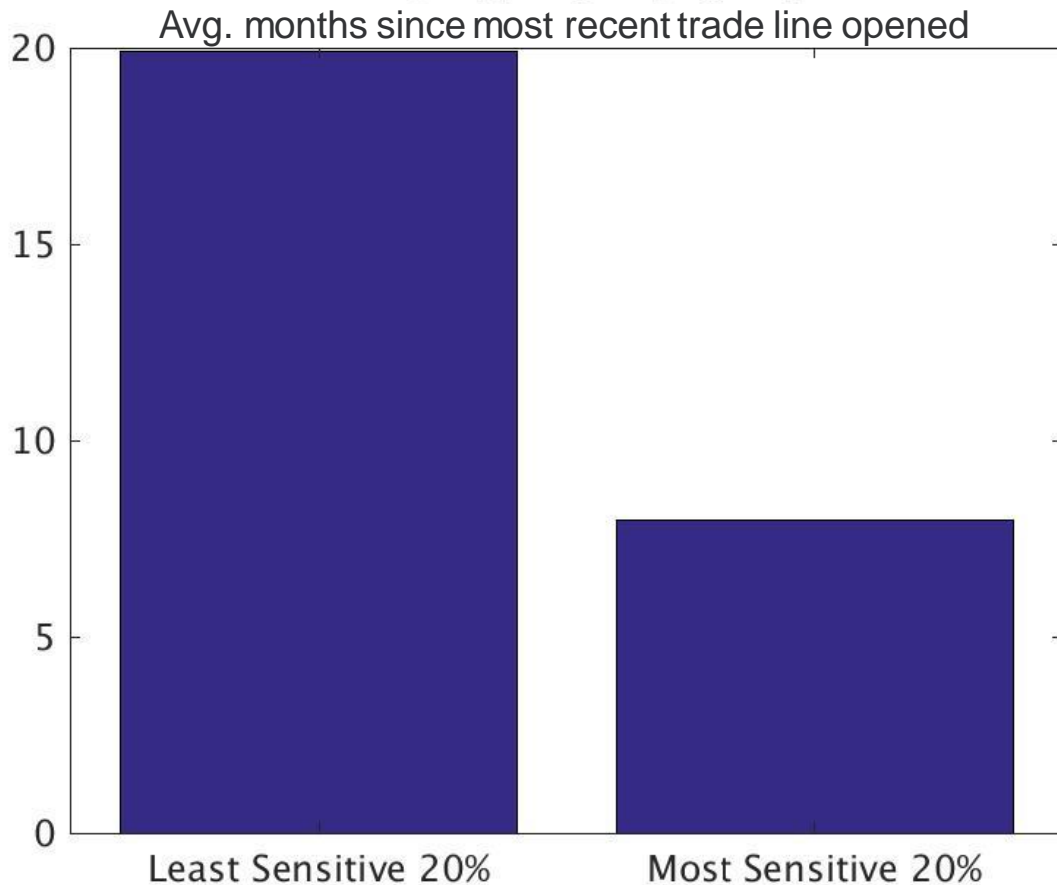
Economic Stress Sensitive FICO® Score 680 Consumers More Actively Search for Credit



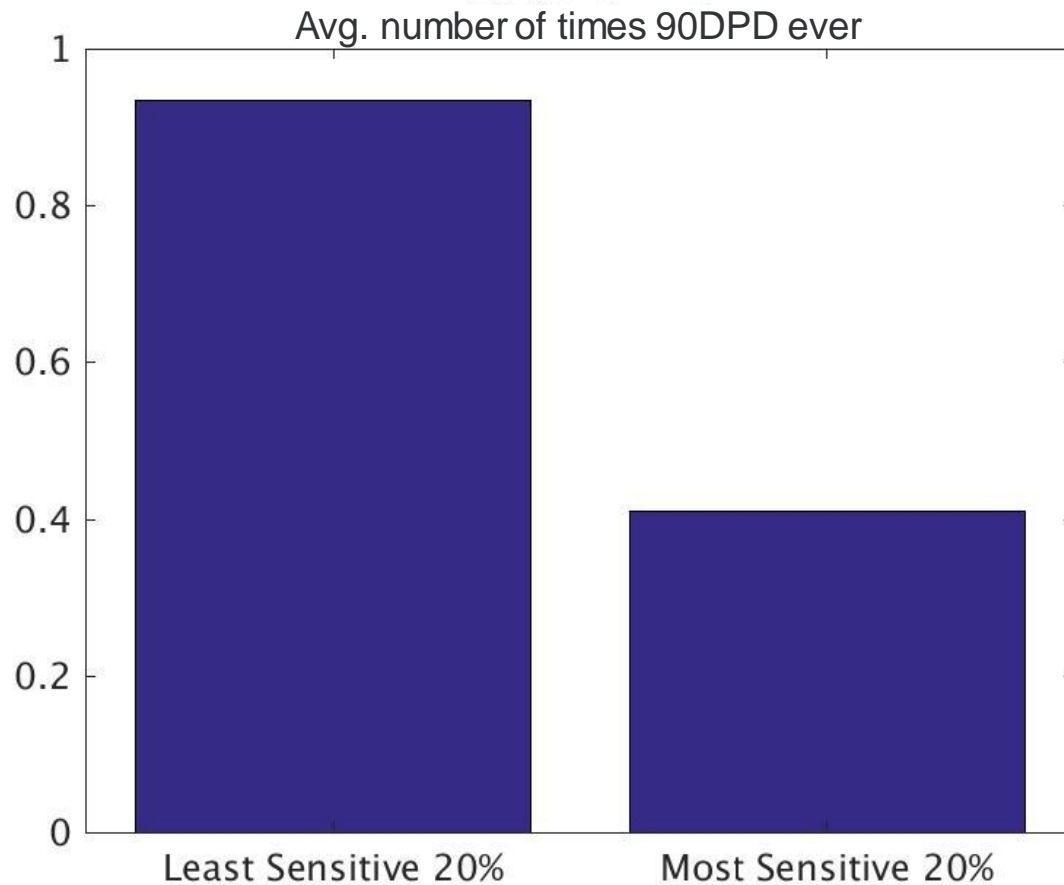
Economic Stress Sensitive FICO® Score 680 Consumers *Have Higher Total Balances*



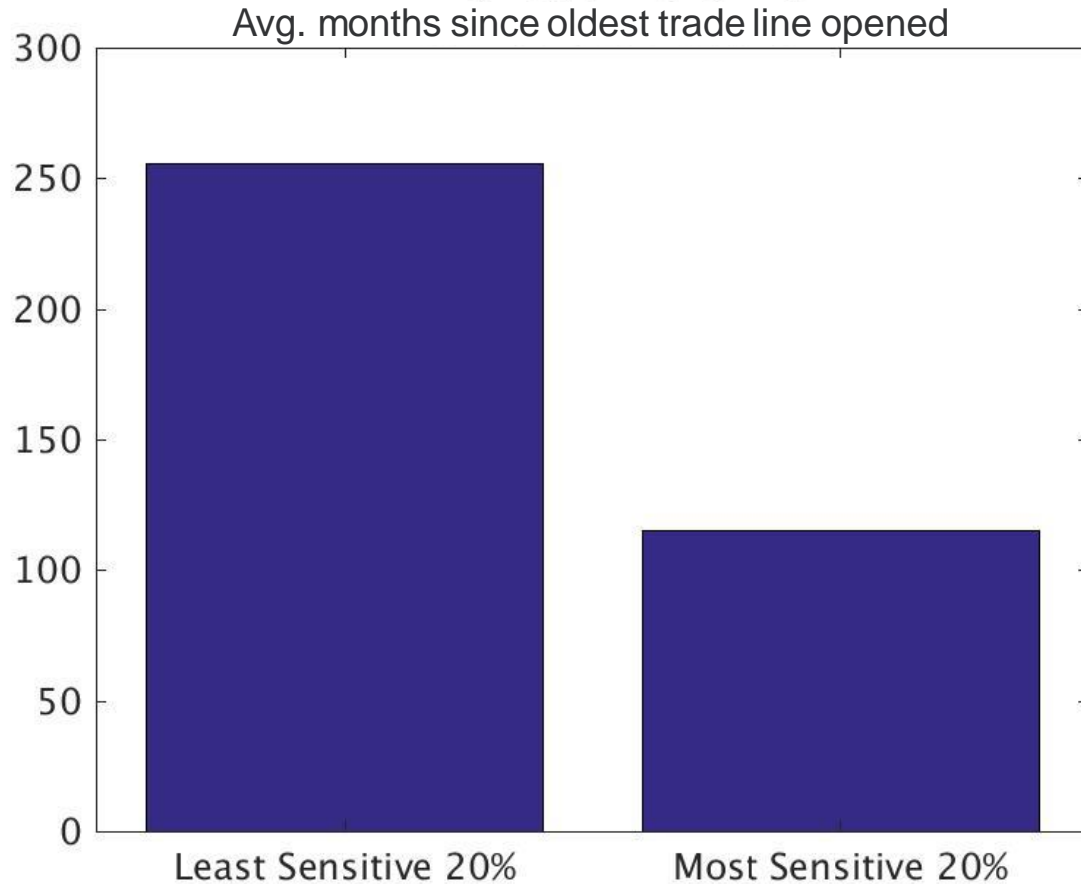
Economic Stress Sensitive FICO® Score 680 Consumers More Recently Opened a New Trade Line



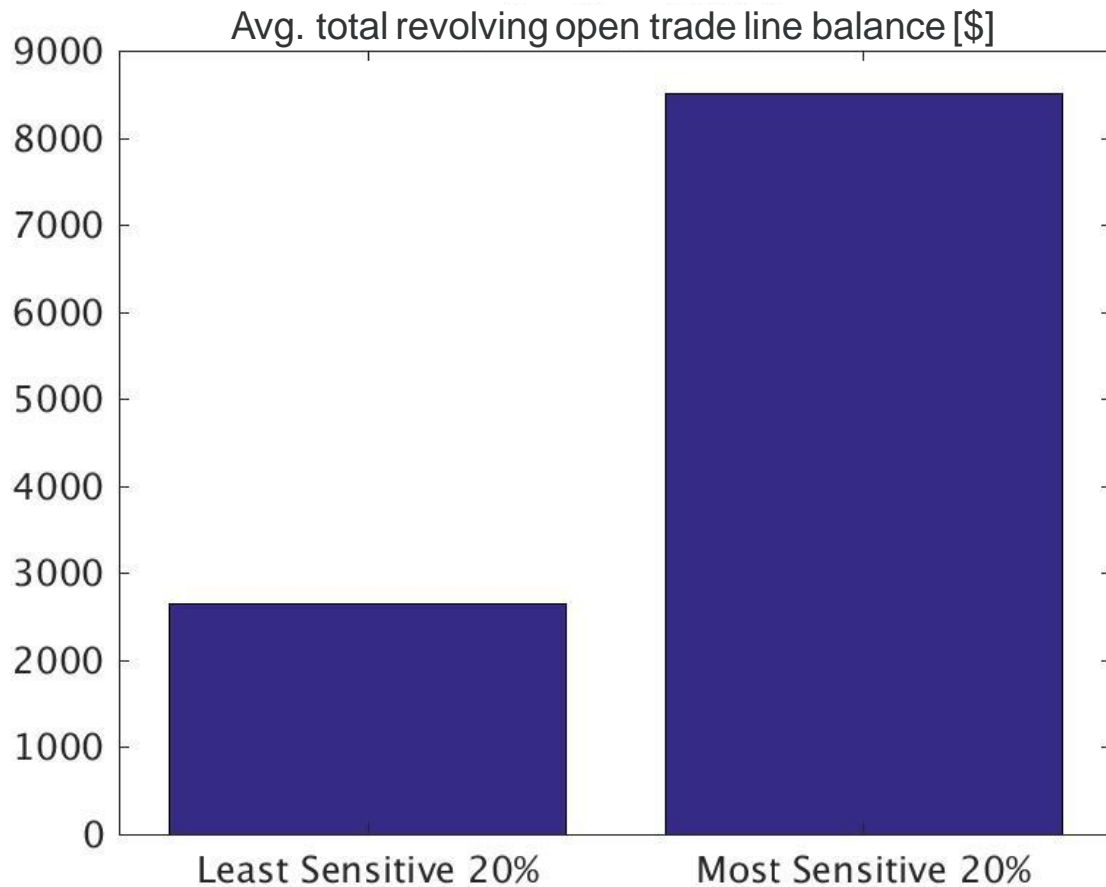
Economic Stress Sensitive FICO® Score 680 Consumers Have Experienced Fewer Delinquencies



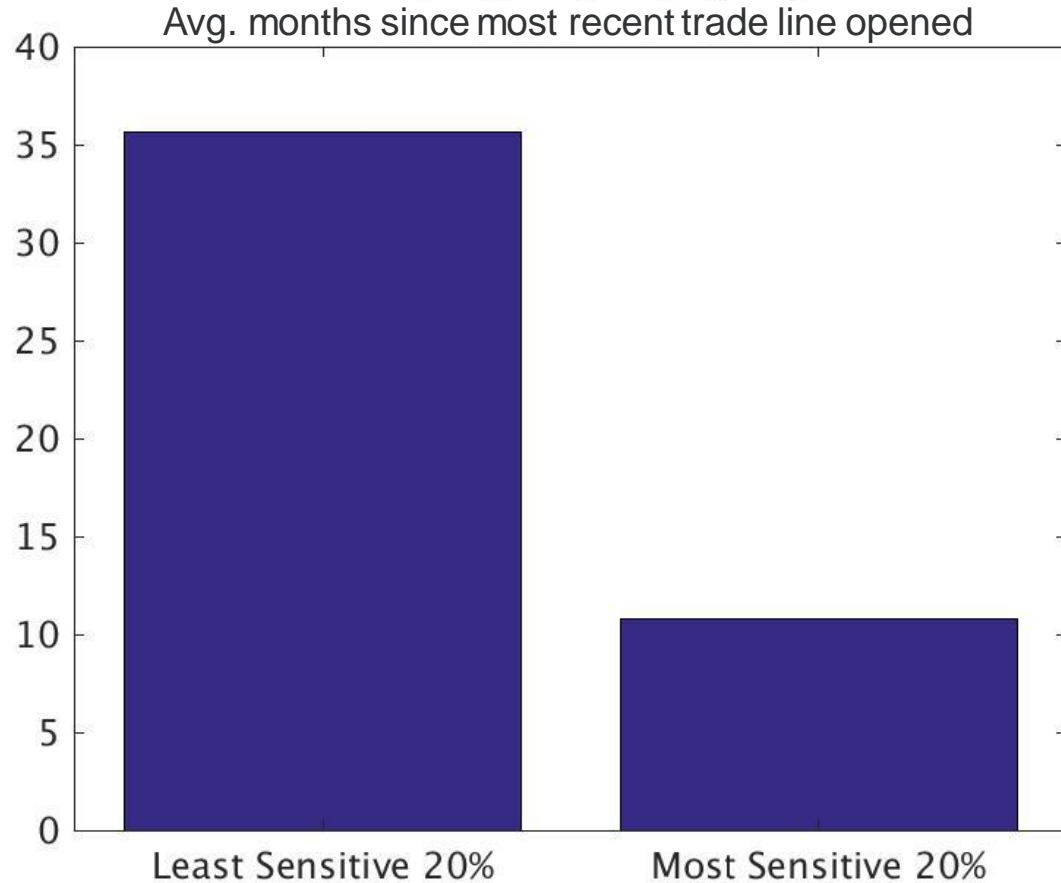
Balance Change Sensitive FICO® Score 680 Consumers Are Less Mature



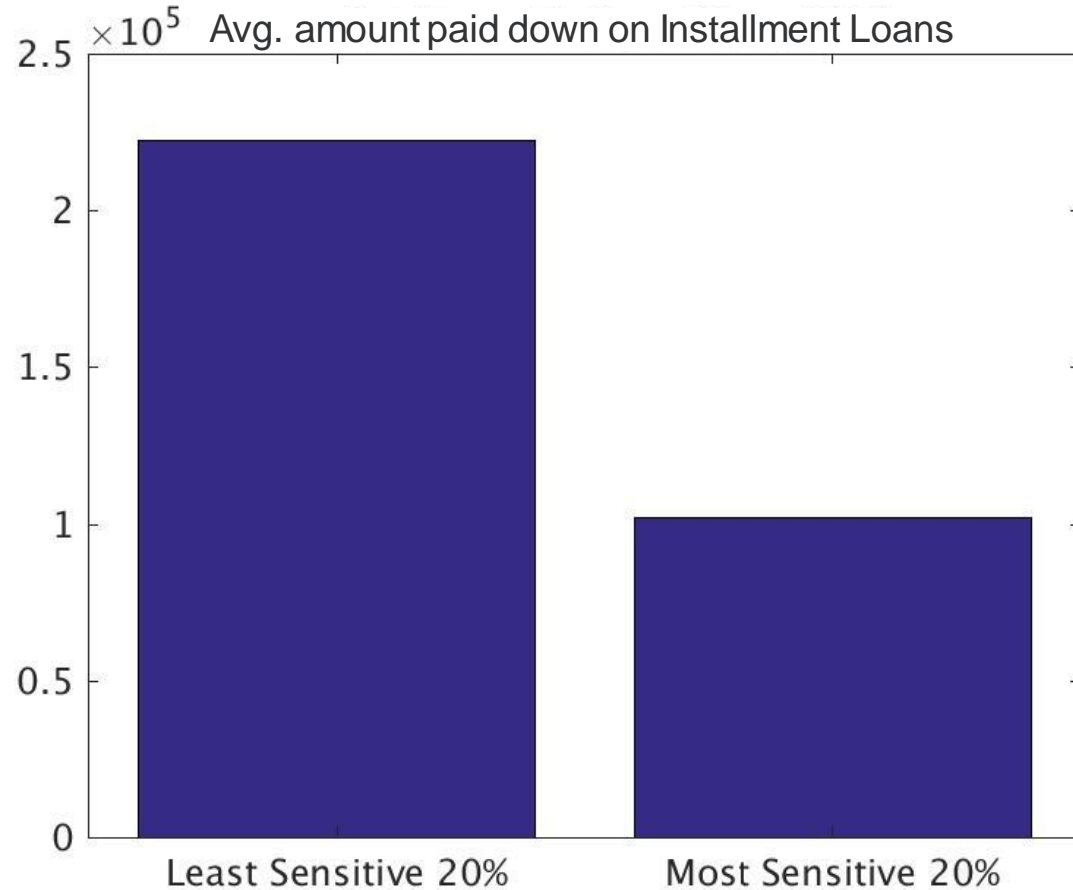
Balance Change Sensitive FICO® Score 680 Consumers Have Higher Revolving Balances



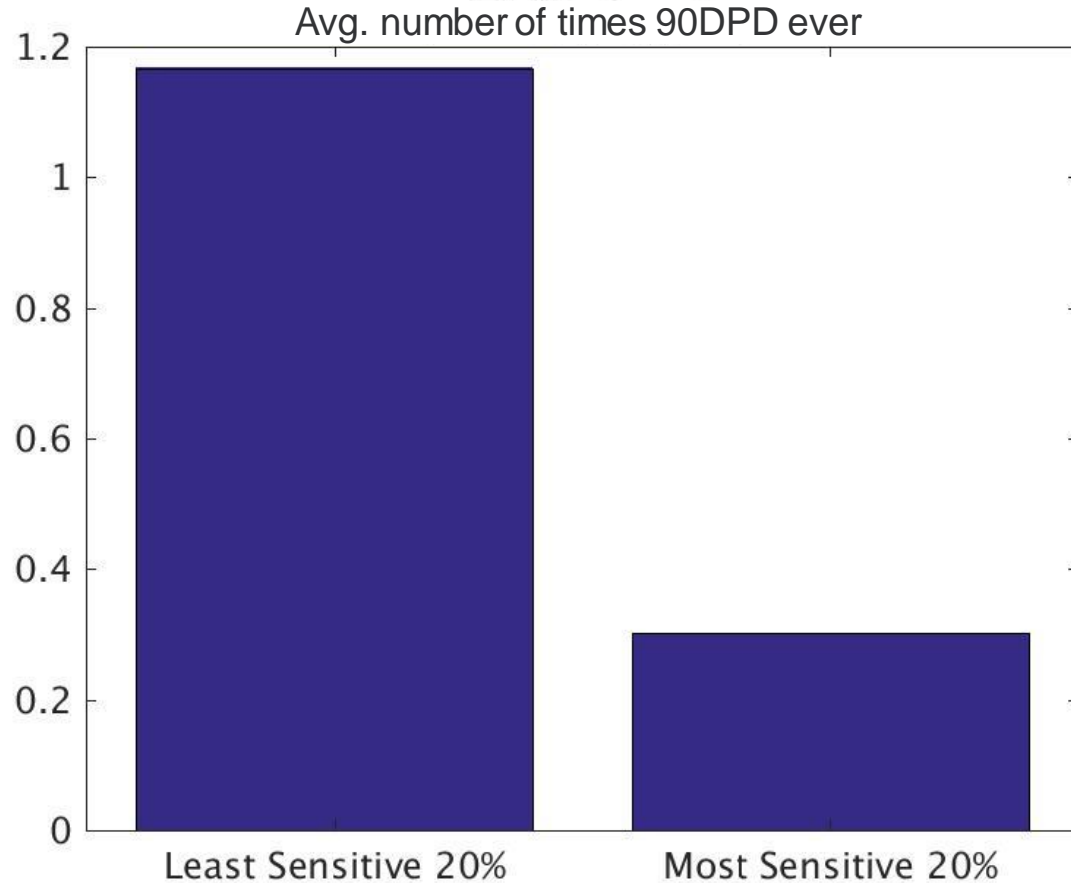
Balance Change Sensitive FICO® Score 680 Consumers More Recently Opened a New Trade Line



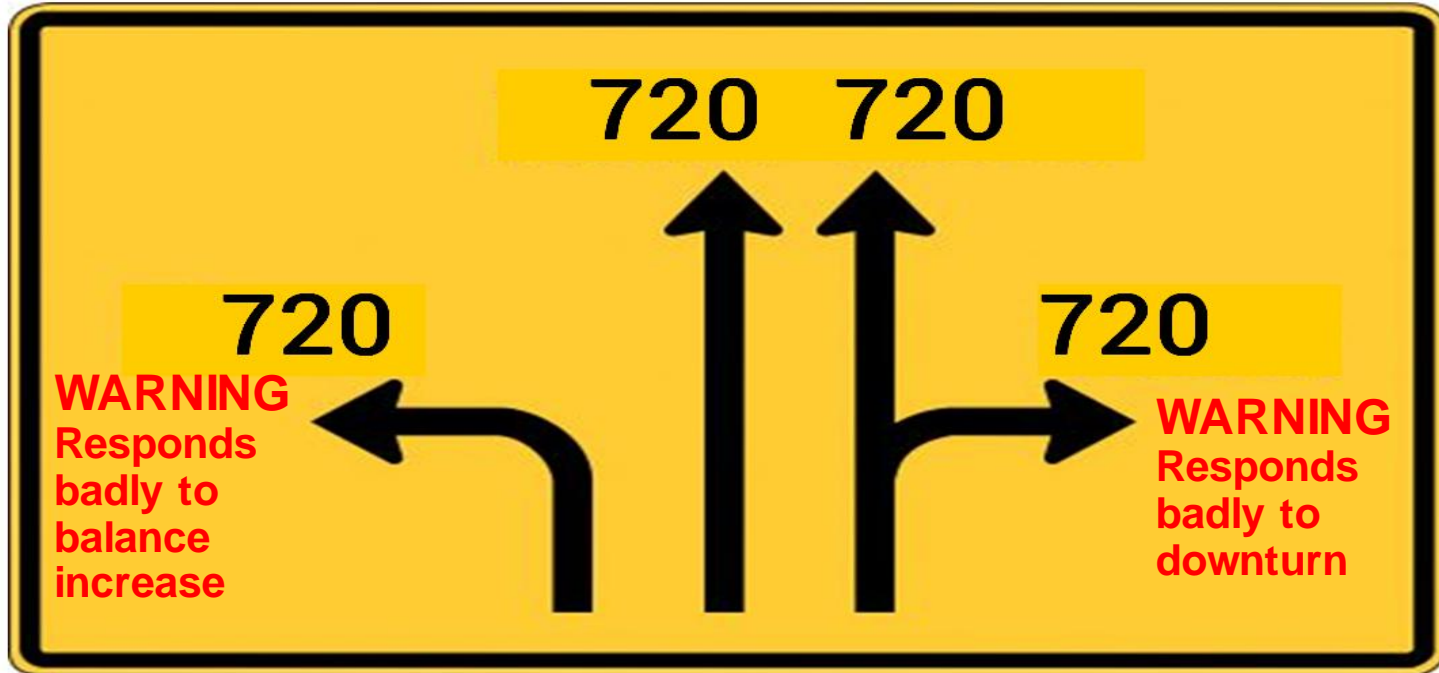
Balance Change Sensitive FICO® Score 680 Consumers Paid Down Less on Installment Loans



Balance Change Sensitive FICO® Score 680 Consumers Have Experienced Fewer Delinquencies



Many Consumers Share the Same Risk Score But Respond Differently to Stresses



- We can now separate stress-sensitive from robust consumers and use this knowledge to mitigate risks related to economic cycle and affordability of card debt
 - By factoring our novel sensitivity indices into marketing and lending policies

Thank You

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